

## Chirag Gupta, Ph.D.

Scientist I

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## SUMMARY

Computational biologist with 5+ years of postdoctoral experience in research and analysis of multi-modal genomics data. Specifically, my research straddles between **regulatory genomics**, **network biology**, and **machine learning** with an aim to develop computationally tractable models of human diseases. I am currently working on projects focused on strategies to guide disease **biomarker discovery**, **drug repurposing**, and **patient stratification** using **multi-modal single-cell** genomic data of the **human brain**. I have extensive experience in written and oral communication to academics and business leaders through contributions to winning grants, 12+ peer reviewed publications, and several conference appearances.

## EDUCATION

2017	<b>Ph.D. Computational Biology</b> (Cell and Molecular Biology) Dissertation: Transcriptome-based gene networks for systems-level analysis of gene function	<b>University of Arkansas,</b> Fayetteville, Arkansas, USA
2009	<b>M.Sc. Bioinformatics</b>	
2007	<b>B.Sc. Bioinformatics</b>	<b>Sardar Patel University,</b> India

## RESEARCH EXPERIENCE

2021 – present	<b>Postdoctoral Research Associate</b> <ul style="list-style-type: none"><li>• PsychENCODE2, PsychAD</li><li>• Single-cell genomics of the human brain</li><li>• Network biology of neuropsychiatric disorders</li></ul>	<b>University of Wisconsin,</b> Madison, Wisconsin, USA
2017 – 2020	<b>Postdoctoral Research Associate</b> <ul style="list-style-type: none"><li>• Plant and crop genomics</li><li>• Machine learning for gene prioritization</li><li>• Web-applications</li></ul>	<b>University of Arkansas,</b> Fayetteville, Arkansas, USA
2012 – 2017	<b>Graduate Research Assistant</b> <ul style="list-style-type: none"><li>• Plant stress and developmental biology</li><li>• Large-scale transcriptomics</li><li>• Gene regulatory networks</li></ul>	
2008 — 2009	<b>Student Researcher</b> <ul style="list-style-type: none"><li>• Hallmarks of fusion proteins in cancer</li><li>• Protein structure prediction</li><li>• Molecular modeling, drug designing</li></ul>	<b>Disha Life Sciences Pvt. Ltd.,</b> Gujarat, India

## PUBLICATIONS

### *Under review/preprints*

1. Yheni Dwiningsih, Julie Thomas, Anuj Kumar, **Chirag Gupta**, Navdeep Gill, Charles Ruiz, Jawaher Alkahtani, Niranjana Baisakh, Andy Pereira. Identification of QTLs and Candidate Loci Associated with Drought-Related Traits of the K/Z RIL Rice Population. ([preprint](#))
2. **Chirag Gupta**, Arjun Krishnan, Andrew Schneider, Cynthia Denbow, Eva Collakova, Pawel Wolinski, Andy Pereira. SANE: The Seed Active Network for Discovering Transcriptional Regulatory Programs of Seed Development. ([preprint](#))

### *Peer reviewed journal articles*

1. **Chirag Gupta**, Jielin Xu, Ting Jin, Saniya Khullar, Xiaoyu Liu, Sayali Alatar, Feixiong Cheng, Daifeng Wang. Single-cell network biology characterizes cell type gene regulation for drug repurposing and phenotype prediction in Alzheimer's disease. ***PLOS Computational Biology***, July 2022. ([full text](#)) ([cover story](#))
2. **Chirag Gupta**, Pramod Chandrashekar, Chenfeng He, Ting Jin, Saniya Khullar, Qiang Chang, Daifeng Wang. Bringing machine learning to research on intellectual and developmental disabilities: taking inspiration from neurological diseases. ***Journal of Neurodevelopmental Disorders*** (IDDRC 2022 special issue on computational neuroscience), May 2022. ([full text](#))
3. Anuj Kumar, **Chirag Gupta**, Julie Thomas, Andy Pereira. Genetic Dissection of Grain Yield Component Traits Under High Nighttime Temperature Stress in a Rice Diversity Panel. ***Frontiers in Plant Science***, September 2021. ([full text](#))
4. **Chirag Gupta**, Venkateshgowda Ramegowda, Supratim Basu, Andy Pereira. Using network-based machine learning to predict transcription factors involved in drought stress resistance. ***Frontiers in Genetics***, June 2021. ([full text](#))
5. Raksha Singh, Rohana Liyanage, **Chirag Gupta**, Jackson Lay Jr., Andy Pereira, Clemencia Rojas. The protein interactomes of AtNHR2A and AtNHR2B unraveled common and specialized functions in plant immunity integrating distinct biological processes. ***Frontiers in Plant Science***, March 2020. ([full text](#))
6. Min Woo Lee, Carmen S. Padilla, **Chirag Gupta**, Aravind Galla, Andy Pereira, Jiamei Li, Fiona L. Goggin. The FATTY ACID DESATURASE 2 family in tomato contributes to primary metabolism and stress responses. ***Plant Physiology***, Nov. 2019. ([full text](#))
7. **Chirag Gupta** and Andy Pereira. Recent advances in gene function prediction using context-specific coexpression networks in plants. ***F1000Research***, Feb. 2019. ([full text](#))
8. Arjun Krishnan, **Chirag Gupta**, Madana MR Ambavaram, Andy Pereira. RECoN: Rice Environment Co-expression Network for systems level analysis of abiotic-stress response. ***Frontiers in Plant Science***, Sep. 2017. ([full text](#))
9. Venkateshgowda Ramegowda, Upinder Singh Gill, Palaiyur Nanjappan Sivalingam, Aarti Gupta, **Chirag Gupta**, Geetha Govind, Karaba N Nataraja, Andy Pereira, Makarla

Udayakumar, Kirankumar S Mysore, Muthappa Senthil-Kumar. GBF3 transcription factor imparts drought tolerance in Arabidopsis thaliana. **Scientific Reports**, August 2017. [[full text](#)]

10. Venkategowda Ramegowda, Supratim Basu, **Chirag Gupta**, Andy Pereira. Regulation of grain yield in rice under well-watered and drought stress conditions by GUDK. **Plant Signaling and Behavior**, January 2015. [[full text](#)]

## CONFERENCE PRESENTATIONS

### Select talks

- Single-cell network biology characterizes cell type gene regulation for drug repurposing and phenotype prediction in Alzheimer's disease. **Alzheimer's Association International Conference**, San Diego, CA, 2<sup>nd</sup> August 2022
- Predicting rice genes important for drought tolerance using gene regulatory networks and machine learning. **Crops InSilico, 4th Annual Symposium and Hackathon**, Urbana, IL, 3<sup>rd</sup> May 2019
- Arabidopsis seed-filling association-network analysis. **American Society of Plant Biologists – Southern Section (ASPB-SS)**, Lexington, KY, 30<sup>th</sup> March 2014.

### Select posters

- Single-cell network biology characterizes cell type gene regulation for drug repurposing and phenotype prediction in Alzheimer's disease, **Intelligent Systems for Molecular Biology**, Madison, WI, July 2022
- Network analysis of human brain cell types under Alzheimer's disease and healthy conditions, **Society of Neuroscience**, Chicago, IL, November 2021
- Network-based approach to prioritize lung cancer genes from whole-exome sequencing data. **Arkansas Bioinformatics Consortium**, Little Rock, AR, 25<sup>th</sup> March 2018
- [Award winning poster] An abiotic-stress conditioned gene regulatory network in rice predicted using an ensemble of reverse-engineering solutions. **The 25th Plant and Animal Genome (PAG) Conference**, San Diego, CA, 14<sup>th</sup> January 2017
- A resource for systems analysis of stress response in rice. **NSF Workshop on plant development and drought stress**, Monterey, CA, 8<sup>th</sup> November 2015
- In Silico Analysis of Fusion Proteins in Cancer, **International Conference on Biomedical and Genomic Research**, Ahmedabad, India, 30<sup>th</sup> January 2009

## AWARDS

1. Crops in silico underrepresented minority travel scholarship, **Crops InSilico**, Urbana, IL, 2019
2. Scherago International Student Travel Grants Awards, **The 25th annual Plant and Animal Genome (PAG) meeting**, San Diego, CA, 2017
3. NSF Travel Grant to attend the Workshop on Plant Development and Drought Stress, **National Science Foundation**, 2015
4. Stood 3<sup>rd</sup> in merit list for all India entrance examination for Master's in bioinformatics program, **Sardar Patel University**, India, 2007
5. 2<sup>nd</sup> Prize in undergraduate oral presentation, **Sardar Patel University**, India, 2006
6. 3<sup>rd</sup> Prize in undergraduate poster competition, **Atmiya University**, India, 2006

## GRANT CONTRIBUTIONS

- **NSF EPSCoR RII Track-2 FEC 1826836:** Systems genetics studies on rice genomes for analysis of grain yield and quality under heat stress (PI: Dr. Andy Pereira; \$4,659,406), 2018
- **NSF MCB 1716844:** Systems genetics analysis of photosynthetic carbon metabolism in rice (PI: Dr. Andy Pereira; \$798,725.00), 2017

## SOCIETY MEMBERSHIPS

2019 - present      **The International Society for Computational Biology (ISCB)**  
2022 - present      **The Alzheimer's Association International Society to Advance Alzheimer's Research and Treatment (ISTAART)**

## SELECT SKILLS

<i>Programming</i>	R, Python, Perl
<i>Bioinformatics</i>	Expertise with standard sequence data (NGS) processing pipelines (single-cell, bulk mRNA, ATAC-seq, ChIP) including quality control, alignment, variant calling, differential expression, and integration
<i>Data science</i>	Extensive experience with data science and machine learning tools in R (caret, e1071, tidyr, dplyr, ggplot2) and Python (NumPy, SciPy, Scikit, Dask, Keras)
<i>Computing Platforms</i>	Fluency with developing automated bioinformatics workflows using Docker, Shiny; Google Cloud

## TOOLS DEVELOPED

<i>GRAiN</i>	<a href="http://rrn.uark.edu/shiny/apps/GRAiN/">http://rrn.uark.edu/shiny/apps/GRAiN/</a>
<i>SANe</i>	<a href="https://plantstress-pereira.uark.edu/SANe/">https://plantstress-pereira.uark.edu/SANe/</a>
<i>RECoN</i>	<a href="https://plantstress-pereira.uark.edu/RECoN/">https://plantstress-pereira.uark.edu/RECoN/</a>

## MENTORING EXPERIENCE

Mentored a graduate student (Masters in Statistics, UW) and four undergraduate students under the University of Madison's Undergraduate Research Scholar contract for two semesters, 2021-2022. Project title: "Using network-based machine Learning to predict genes underlying neurological disorders"

## TEACHING EXPERIENCE

Co-taught Plant Genomics (**Bioinformatics/Genomics modules**: CSES 5543, Uni. Of Arkansas), 2016, 2018

## EXTENSION ACTIVITIES

Student and Teacher Workshop: rice genetic variation (18 credit hours, Uni. Of Arkansas), 2019

## ACADEMIC SERVICE

- **Youth Editor** for iMeta, Wiley Online Library, Sep. 2022

- **External reviewer** for IEEE International Conference on Bioinformatics and Biomedicine (BIBM) 2022.
- **Specialty review editor** for Frontiers in Bioinformatics and Frontiers in Genetics
- **Manuscript reviewer** for Human Molecular Genetics, Journal of Neurodevelopmental Disorders, Plant Physiology, Frontiers in Plant Science, Nature Scientific Reports, Rice, Plant Cell Reports, Horticultural Plant Journal, Plant Methods, PLoS One, iMETA.
- **Plante Fellow 2019:** Contribution to the Plantae online portal for Bioinformatics resources relevant to plant biology research
- **Member of the panel of judges** for the Northwest Arkansas Regional Science and Engineering Fair 2015,16
- Conducted several training material and hands-on activities for undergraduates and K-12 students from the Arkansas agricultural areas in the Delta region for a **STEM literacy outreach program**

## REFREES

Available upon request